

Bootcamp Attrition Rates: Predictions for FY 1999

Aline O. Quester

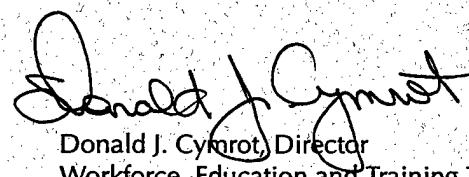
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This briefing examines bootcamp attrition, including predictions for FY99 rates, subsequent fleet attrition, and the role of recruit quality. We project a FY99 Navy bootcamp attrition rate of 20 percent, up 4 percent from FY98. We found holding down bootcamp attrition did not result in increased fleet attrition for these accession cohorts, as measured by 33-month attrition rates for accessions from FY90 through FY95. Finally, we observed changes in recruit quality explain only a small part of attrition increase, as measured by high school diploma graduates, AFQT, and Delayed Entry Program (DEP).		
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Bootcamp Attrition Rates: Predictions for FY 1999

Dr. Aline Quester
May 1999

CNA

Background

- Recent recruiting/endstrength/manning difficulties heighten interest in bootcamp attrition
- Higher bootcamp attrition means
 - CNRC must recruit replacements
 - N1 must achieve endstrength or man the fleet with fewer sailors
 - N7 must balance undermanning with quality concerns

Within the Navy, higher bootcamp attrition has a direct and immediate effect on CNRC, N1, and N7. N7 feels both an immediate impact and a more delayed impact: CNRC must recruit replacements and the bootcamp and A-school plans need to be changed. Because changes in accession plans usually mean higher summer accessions, N7 sometimes finds it difficult to accommodate the increased accessions necessary in the already full summer months. Finally, if CNRC does not recruit the additional accessions to make up for the higher bootcamp losses, the fleet feels the impact because manning is lower.

Another important point about bootcamp attrition is that recruits do not go to bootcamp to fail. Moreover, each recruit has a support group of parents and friends who know the recruit was going to Great Lakes to become a sailor. Each recruit we separate and send home probably becomes somewhat of a “bad will” ambassador for the Navy, compounding the difficulty recruiters will have in finding replacements.

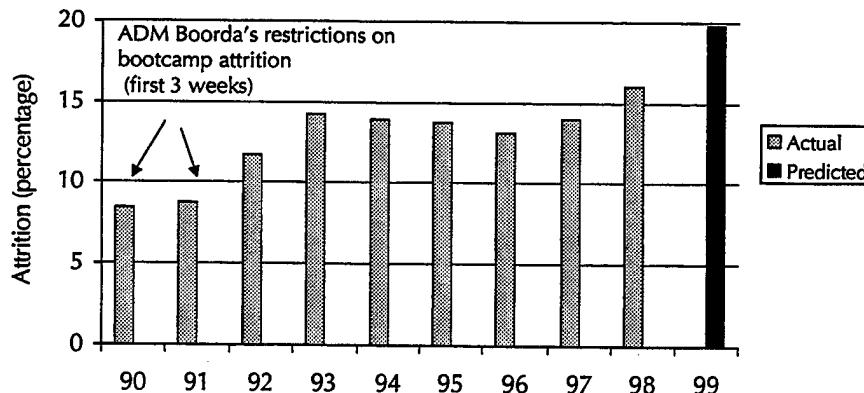
Finally, bootcamp attrition is expensive. We estimate that it costs about \$10,000 for each recruit the Navy must replace. Thus, each percentage point of bootcamp attrition translates into about 500 recruits who must be replaced at a cost of about \$5 million.

Outline

- Navy bootcamp attrition
 - We predict an FY99 bootcamp attrition rate of about 20%
- Bootcamp attrition vs. subsequent fleet attrition
- Observed changes in recruit quality explain only a **small** part of attrition increase
 - As measured by high school diploma graduates (HSDGs), Armed Forces Qualification Test (AFQT), and Delayed Entry Program (DEP)

This slide summarizes the three main topics in this briefing.

Navy Bootcamp Attrition Rates



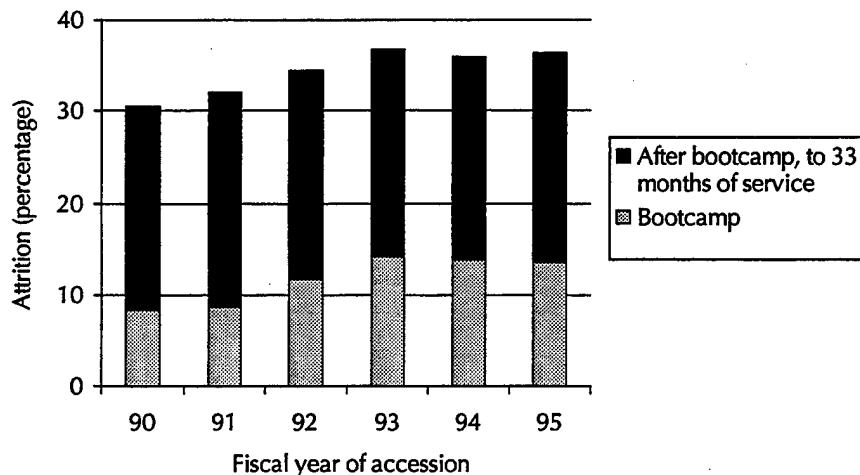
The slide shows actual bootcamp attrition rates for FY90-98, as well as the bootcamp attrition rate we project for FY99.*

As the “war on attrition” waned and various restrictions that Admiral Boorda had placed on bootcamp attrition disappeared,** bootcamp attrition rose to between 12 and 14 percent. Since 1996, bootcamp attrition has been rising steadily (12.9 percent in FY96, 14.1 percent in FY97, and 15.9 percent in FY98). We project it will be almost 20 percent for FY99.

*The data for accessions from FY90 to FY94 are from CNA's historical accession files; bootcamp attrition rates are computed SSN by SSN for all recruits shipped to bootcamp. Bootcamp attrition rates from FY95 to FY98 are from CNET published data, calculated as attrites in the period divided by accessions in the period. The bootcamp attrition rate we project for FY99 is based on CNET's published data and data published for this year (through March).

**In the late 1980s, attrition was a topic of considerable concern to the Chief of Naval Personnel, Vice Admiral Boorda. He asked CNA to look at attrition, particularly at trends in attrition. We found that attrition rates were up throughout the Navy. For example, while the 6-month attrition rate for high school diploma graduates had been 8 to 10 percent for accession cohorts from FY79 to FY85, it was 12 percent for FY86 accessions and 14 percent for FY87 accessions (see CRM 89-17, *Navy First-Term Attrition*, by Timothy W. Cooke and Aline O. Quester, November 1989). In a CNO Admin message of May 1989, OP01 and CNET were directed to “continue actions in progress to reduce...RTC attrition by one third” (CNO OP ZERO 200001Z May 89). In late 1989, Admiral Boorda established many attrition-reduction initiatives, including a “discharge moratorium for the first 3 weeks of boot camp.” Another initiative was specific goals for the number of discharges from 6 June 1989 through 1 October 1989 on the number of bootcamp separations (1,326 for Great Lakes, 1,088 for Orlando, and 986 for San Diego). Various OP 01 briefings in 1990 and early 1991 indicate that these initiatives were continuing.

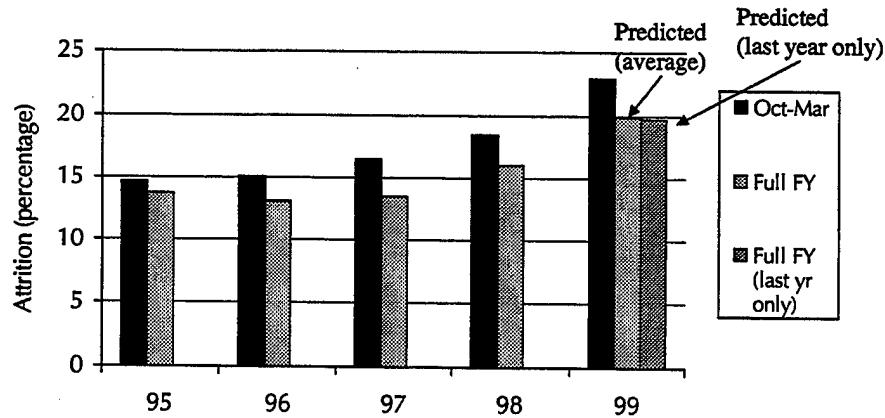
Did Low Bootcamp Attrition Mean Higher Attrition Later in the Fleet?



Here we show 33-month attrition rates for accessions from FY90 to FY95.* Despite predictions that fleet attrition would increase for FY90-91 accessions, this was not the case. Holding down bootcamp attrition did not result in increased fleet attrition for these accession cohorts.

*FY95 is the most recent year for which we can observe the full 33 months.

Navy Bootcamp Attrition Rate Comparisons



All data are from CNET reports. The attrition rate is calculated as attrites in the period divided by accessions in the period.

Displaying year-to-date comparisons of the *same period* over several years is an effective way to show how we are doing relative to the same period in previous years. It is important to use the same periods because seasonality in accession phasing causes fairly systematic differences in attrition rates for different periods in the year.* When the year-to-date results are lined up next to the results for the full year, we can see the historical relationships between the two rates. The dark bars show the year-to-date (October through March) attrition rates. These rates have been rising steadily (14.7 percent for FY95, 15.1 percent for FY96, 16.5 percent for FY97, 18.5 percent for FY98, and 22.9 percent for FY99).

As the slide shows, the full-year bootcamp attrition rate has been lower than the attrition for the first 6 months of the year. In the summer, we get the lower attrition recruits who have just graduated from high school and have been in the DEP.

Over the years of these data, bootcamp attrition for the full year averaged 87.0 percent of the rate for the first 6 months of the year. Last year, the full-year rate was 86.5 percent of the half-year rate. Thus, if this year follows historical patterns, FY99 bootcamp attrition will be 19.9 percent. If it follows last year's pattern, it will be 19.8 percent.**

* One also needs a reasonable period of months before year-to-date calculations are meaningful.

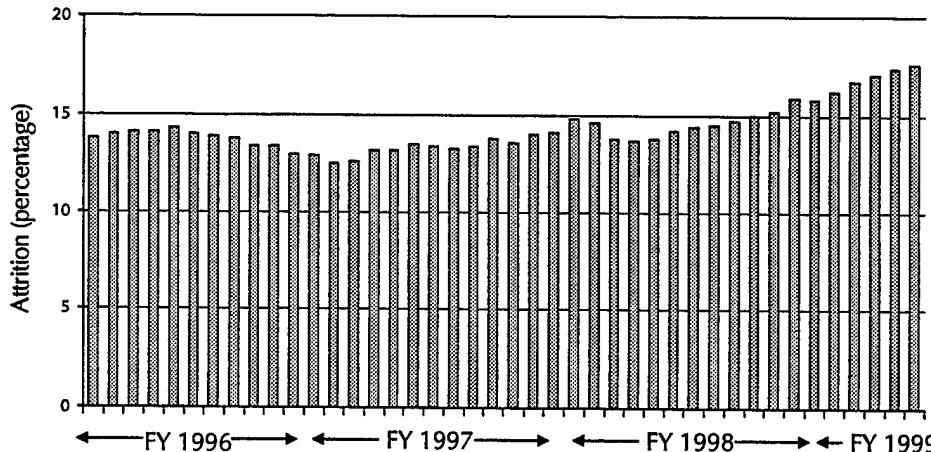
**One can measure bootcamp attrition in several ways (12-month moving averages, attrites/accessions, attrites/student flow, etc.). We predicted bootcamp attrition for FY99 using each of these methods; all methods come out very close to a prediction of 20-percent attrition rate for bootcamp. (See backup slides for calculations.)

October through March Data

FY	Bootcamp		Rate (percentage)
	Attrites	Accessions	
1995	3,230	21,932	14.7
1996	3,462	22,861	15.1
1997	3,634	22,082	16.5
1998	3,653	19,722	18.5
1999	4,128	18,007	22.9

This slide shows the numbers of accessions, attrites, and the bootcamp attrition rates for the first 6 months of FY95-99.

Navy Bootcamp Attrition Rates: 12-Month Moving Average, Oct 95-Mar 99



All data are from CNET reports. The attrition rate is calculated as attrites in the period divided by the student flow in the period.

CNET monthly attrition reports since FY98 have used a 12-month moving average to describe bootcamp attrition. In the past, we have been quite critical of this measure because we believe that a 12-month moving average provides very little information about what is happening in the current month. Events in the current month tend to be overwhelmed by what happened in the previous 11 months. We have also argued that moving averages barely change from month to month, even if attrition patterns are changing.*

However, moving averages are very good for picking up long-term trends. When attrition rates are rising, a 12-month moving average will rise. **Indeed, the 12-month moving average has risen every month since January 1998.** In January 1998, bootcamp attrition had averaged 13.7 percent for the last 12 months. By March 1999, the average for the past 12 months was 17.6 percent.**

A 12-month moving average, by definition, already has all 12 months of information. Thus, unlike many of the other measures of bootcamp attrition, it is not affected by seasonality. It will fall in July 1999 only if the attrition in July 1999 (the month that is added to the average) is less than the attrition in July 1998 (the month that will be dropped from the average). **The 12-month moving average attrition rate did not fall last summer:** it was 14.7 percent in June, 15.0 percent in July, 15.2 percent in August, and 15.9 percent in September.

*See CRM 98-76, *Final Report for CNA Study on Answering Decision-Makers' Questions: Organizing Training Information for Policy Analysis*, by A. Quester, M. MacIlvaine, L. Barfield, L. Parker, and D. Reese, June 1998.

** CNET monthly attrition rates for January and February 1999 were 25.2 and 25.7 percent, respectively.

Why Is Bootcamp Attrition Up?

- Recruit quality is down
 - More direct ships, non-HSDGs, lower AFQT scores
 - **But, most recruits are still A-cell (test scores above average and high school graduates)**
- Very small proportion of increase since 1996 due to observed changes in accession quality
 - *At most* counts for one-fifth of the increase in attrition
- Most of attrition increase is within quality cells

The current recruiting environment may well be the toughest one faced by the All Volunteer Force. The civilian unemployment rate is the lowest it has been for 25 years, youth wages are rising, and there is strong competition from colleges and universities. Even the Air Force is having trouble meeting its accession goals.

The Navy missed its recruiting goal in FY98 by about 7,000 accessions. In FY99, the Navy started the recruiting year with only 28 percent of FY99 accessions contracted. This is the smallest start-year DEP pool that we have ever seen since 1990. And, before that we need to go back to 1982 to get another start-year DEP pool that is so small.

Against this backdrop, it is not surprising that accession quality has dropped. However, as later slides will show, the observed changes in accession quality only account for a small portion of the sharp increase in bootcamp attrition.

Recruit Quality Cells and Baseline (FY94-96) Bootcamp Attrition Rates

- Cell 1: AFQT I-II, HSDG, DEP -- 9.8%
- Cell 2: AFQT IIIA, HSDG, DEP -- 12.4%
- Cell 3: AFQT IIIB, HSDG, DEP -- 15.2%
- Cell 4: AFQT I-III A, HSDG, direct ship -- 14.3%
- Cell 5: AFQT IIIB, HSDG, direct ship -- 18.8%
- Cell 6: all AFQT, non-HSDG, DEP -- 21.4%
- Cell 7: all AFQT, non-HSDG, direct ship -- 26.1%

Source: CNA accession cohort data

Previous research has found that the most significant predictors of bootcamp attrition are educational background, participation in the delayed entry pool, and test scores.* In light of this, CNA established the seven quality cells shown above. The slide also provides information on the bootcamp attrition rates of each quality cell in the baseline period (FY94-96) accessions. As one can see, bootcamp attrition rates vary substantially among the different quality cells.

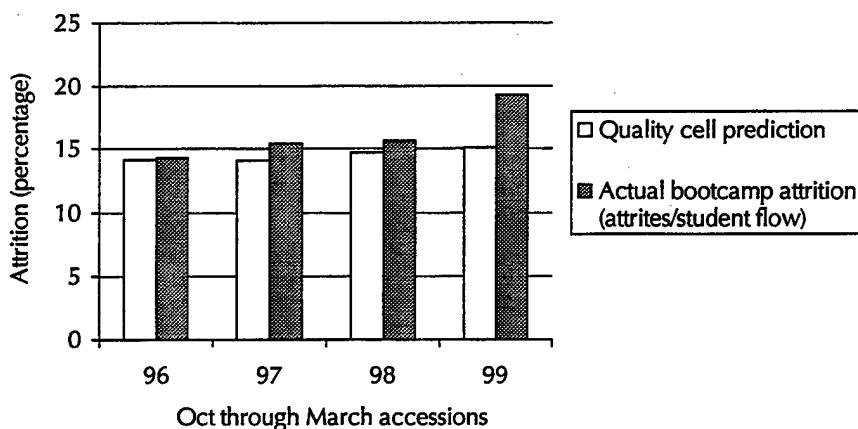
Remember, however, that most recruits still come from the top quality cells. For example, let's compare the percentage of recruits in each cell for the October through March period in FY97 and FY99.

<u>Quality cell</u>	<u>Percentage of accessions</u>	
	<u>Oct-Mar 1997</u>	<u>Oct-Mar 1999</u>
1	32.3	27.9
2	17.5	14.6
3	23.6	21.4
4	7.6	6.6
5	4.3	4.8
6	12.2	19.0
7	2.6	5.7

Note: High school diploma graduates (HSDGs) have the lowest attrition rates. DOD identifies these recruits as Tier I.

*Some recent research shows that preservice smoking is also a strong predictor of bootcamp attrition. Unfortunately, preservice smoking information was not available for this analysis.

Actual Bootcamp Attrition Vice Attrition Predicted From Quality Cell Distribution



Note: Quality cell predicted attrition is from baseline FY94-96 quality cell attrition behavior.

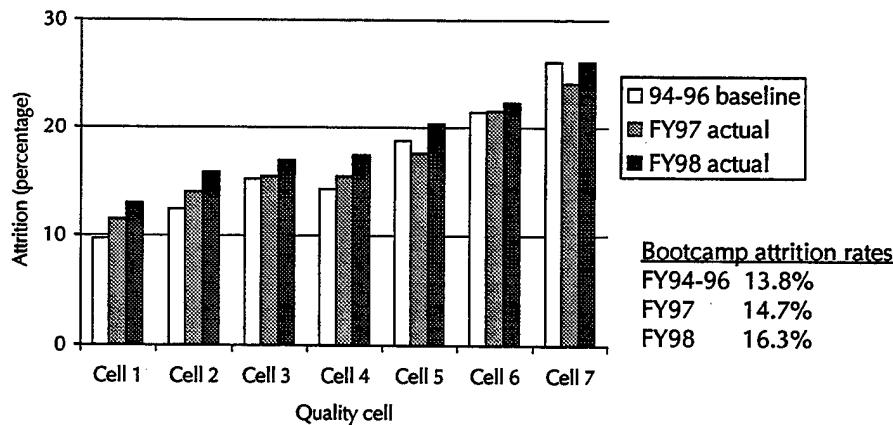
Each month CNA receives from CNET the counts of the monthly accessions in each of the seven quality cells. With these counts, we are able to establish the quality distribution of accessions for each month. Here we focus on accessions in the first 6 months of each fiscal year. We won't know the actual quality cell attrition rates for FY99 recruits for some time,* but we do know the numbers of recruits in each quality cell.

Here we used the baseline attrition rates for each quality cell and the actual quality cell distributions to calculate the "quality cell predicted attrition" for the first 6 months of each fiscal year. This prediction, shown as white bars on the slide, reflects the attrition one would have had *if the accessions had attrited at the baseline quality cell rate (FY94-96)*. As one can see from the slide, reductions in quality over the period would have caused the attrition rate to increase by about 1 percentage point (from 14.2 percent in FY96 to 15.1 percent in FY99). The attrition rate, however, increased considerably more than that accounted for by the observed changes in accession quality. The actual attrition rates, depicted by the dark grey bars, show an increase of 5 percentage points (from 14.3 percent in 1996 to 19.3 percent in 1999).

Attrition rates that we would have predicted from the accession quality are far below the attrition rates reported by the bootcamps in the CNET reports. These rates are shown as dark grey bars.

*CNA receives the fiscal year accession files about 6 months after the end of the fiscal year. Thus, it will not be until March 2000 that we will be able to calculate FY99 attrition rates by recruit characteristics.

Navy Bootcamp Attrition Rates: Historical Baseline Vice Current Rates



Note: These attrition rates are calculated SSN by SSN from CNA files.

On this slide we show the bootcamp attrition rates, by quality cell, for the baseline period and for FY97 and FY98 accessions. Unlike much of the analysis in this briefing that was done by aggregate data obtained from CNET, this analysis is done on individual data, SSN by SSN.*

For FY97 and FY98 accessions, the overall attrition rates increased, with the sharpest increases for FY98 accessions. As the previous slide showed, most Navy accessions are in quality cells 1-3 (high school diploma graduates with some DEP and varying AFQT scores). For FY98, about three-quarters of recruits came from quality cells 1-3: 30.3 percent from cell 1, 18.2 percent from cell 2, and 25.7 percent from cell 3.

We have over 20 years of data to show that cell 1 recruits have the lowest bootcamp and fleet attrition of any of the quality groups. In this recent increase in bootcamp attrition, however, it is the attrition rate for this "best group" that has risen the most sharply. In contrast, the attrition rates for the lowest quality cells (quality cells 6 and 7) have barely changed. Quality cell 1 recruits are high school diploma graduates (or better) with DEP and with AFQT scores greater than the 65th percentile. For the base period, their bootcamp attrition rate was 9.8 percent. For FY98 accessions in this quality group, the bootcamp attrition rate was 13.0 percent.

*We do not receive the SSN-based accession files until about 6 months after the end of the fiscal year. Thus, we will not be able to do any individual attrition analyses for FY99 accessions for about a year.

What About Recruits With Longer DEP?

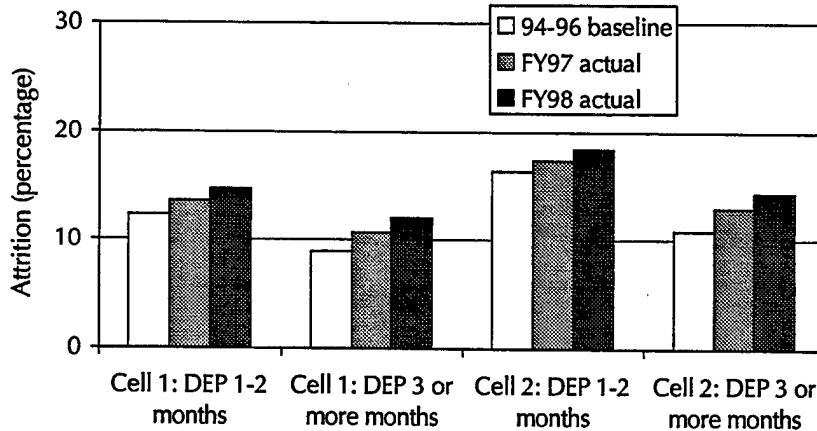
- Recruits with 3 or more months in DEP have lower attrition
- Look at our best recruits
 - Cell 1 and Cell 2
 - Compare those with 1-2 months DEP vs. 3 or more months
- Attrition for these “long DEP,” HSDGs, and top AFQT scores is increasing

The current recruiting environment may well be the toughest one faced by the All Volunteer Force. The civilian unemployment rate is the lowest it has been for 25 years, youth wages are rising, and there is strong competition from colleges and universities. Even the Air Force is having trouble meeting its accession goals.

The Navy missed its recruiting goal in FY98 by over 7,000 accessions. In FY99 the Navy started the recruiting year with only 28 percent of FY99 accessions contracted. This is one of the smallest start-year DEP pools of the past 20 years.

Against this backdrop, it is not surprising that accession quality has dropped. However, as later slides will show, the observed changes in accession quality account for only a small portion of the sharp increase in bootcamp attrition.

Navy Bootcamp Attrition Rates for Top Recruits: By Length of Time in DEP



Note: These attrition rates are calculated SSN by SSN from CNA files.

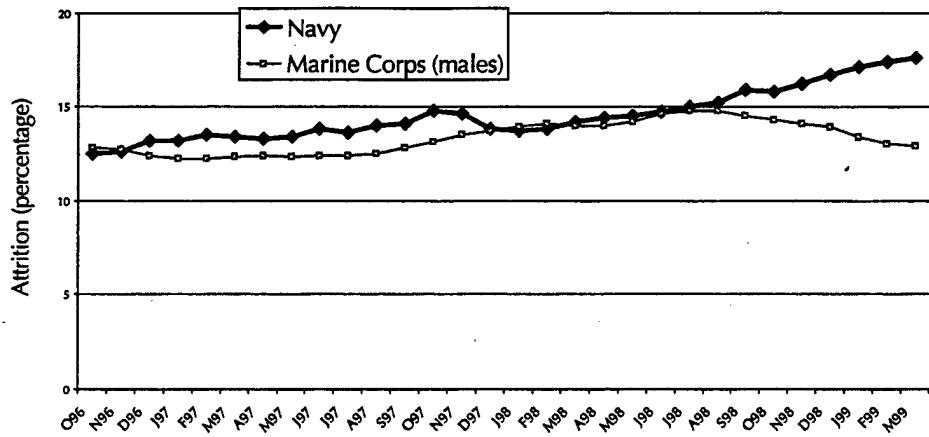
Admiral McGann asked us to do some further analysis. In particular, she was interested in expanding the definition of "best quality recruit" to those who were in the DEP for at least 3 months. Thus, on this slide we look at the top quality cells, cell 1 (AFQT I-II, HSG, DEP) and cell 2 (AFQT IIIA, HSG, DEP), by length of time in the DEP. Unfortunately, we cannot do this analysis for FY99 accessions yet, and FY99 shows the largest attrition increases.*

As is clear from the attrition rates on the slide, cell 1 and cell 2 recruits with at least 3 months in the DEP have the lowest attrition. However, there have been substantial increases in the attrition rates for these groups in FY97 and FY98. We expect even sharper increases for FY99.

In summary, reductions in accession quality have played a small part in the recent increases in bootcamp attrition rates. Most of the increases in attrition rates, however, have been within quality categories. And, again, the largest increases have been in the category of recruits who have historically had the lowest attrition rates. In fact, these high-quality recruits still have the lowest attrition rates. It is simply that "the lowest attrition rates" have risen substantially!

*We do not receive the SSN-based accession files until about 6 months after the end of the fiscal year. Thus, we will not be able to do any individual attrition analyses for FY99 accessions for about a year.

Navy and Marine Corps Bootcamp Attrition Rates: 12-Month Moving Average



Navy data are from CNET reports and Marine Corps data from MCRC Monthly Briefings. The attrition rate is calculated as attrites divided by accessions.

This slide compares Navy and Marine Corps bootcamp attrition. In my work for the Marine Corps, I have been monitoring male bootcamp attrition at the two recruit depots for the past few years. I have only kept data on males (95 percent of Marine Corps accessions are male). The Marine Corps has been working very hard to bring down attrition over the last year, and it appears that their efforts have paid off.

Conclusions

- We project an FY99 Navy bootcamp attrition rate of 20 percent
 - FY98 was about 16 percent
 - FY95-97 averaged under 14 percent
- Observed changes in accession quality cause a very small proportion of attrition increase
- FY90-91 restrictions on bootcamp attrition
 - Did not result in increased fleet attrition for these accession cohorts

The slide summarizes our main analytic findings. Over the first 6 months of this year, the Navy's bootcamp attrition rate has been over 20 percent. Based on the historical relationship between the half-year rate and the full-year rate, this projects to an FY 99 bootcamp attrition rate of about 20 percent, which is well above previous years. Changes in recruit quality (as measured by percent HSDG, AFQT scores, and time in DEP) can explain at most 1 percentage point of the increase.

Concern about bootcamp attrition in the past has led the Navy to place restrictions on bootcamp attrition. For example, in FY90 and FY91, a discharge moratorium for the first 3 weeks of bootcamp was in place. In examining these cohorts, we found that their subsequent fleet attrition was *no higher* than that of other cohorts. These data support the notion that placing restrictions on bootcamp attrition will not simply push attrition out to the fleet.

Backup

**Alternative Projection Methods
and
More Technical Information**

Separation Reasons: FY96 Bootcamp Attrites (n = 5,536)

- Bootcamp separations coded into 2 systems (NITRAS and EMR (DoD codes))
 - Provide very different pictures of attrition reasons for the same recruits!
- Medical or physical reasons
 - 32.8% of separations in NITRAS; 24.7% in EMR
- Fraudulent enlistments (drugs/alcohol)
 - 25.3% of separations in NITRAS; less than 1% in EMR
- Personality disorder/failure to perform
 - 15.1% of separations in NITRAS; 23.9% in EMR

These findings were detailed in the report we authored for CNET last year.* This work, which looked at separation reasons in the two systems for the same recruits, validates a long history of work at CNA on separation reason.

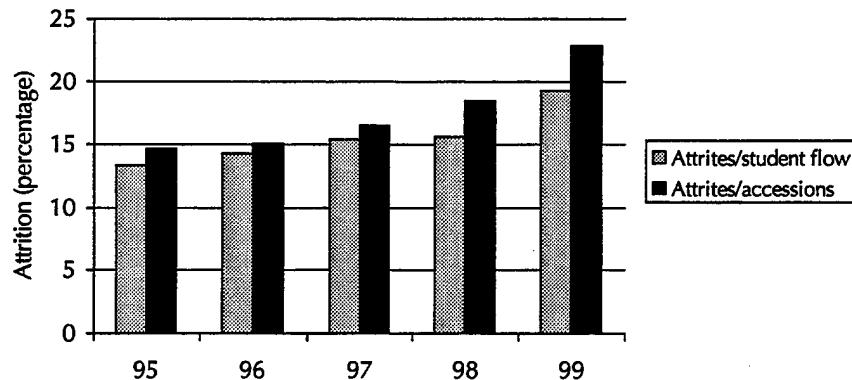
CNA analysts have long argued that separation reason code analyses are generally less useful than is commonly believed.

- The separation reasons have no hierarchy, leaving considerable discretion when there are multiple problems
- Our past work has questioned the validity of the individual separation reasons because of the wide, year-to-year swings in the numbers of separations under specific codes.

This work on FY96 separations from bootcamp confirms our earlier impressions. The reasons for the separations were coded differently in the two systems. If an analyst looked at NITRAS data on bootcamp separation reasons, he or she would have reached a very different conclusion on the problems than if he or she had looked at the EMR data.

*Research Memorandum 98-76, *Final Report for CNA Study on Answering Decision-Makers' Questions: Organizing Training Information for Policy Analysis*, by Aline Quester, Martha MacIlvaine, Lisa Barfield, Laura Parker, and David Reese, June 1998.

Navy Bootcamp Attrition Rates: Year-to-Date (Oct-Mar)

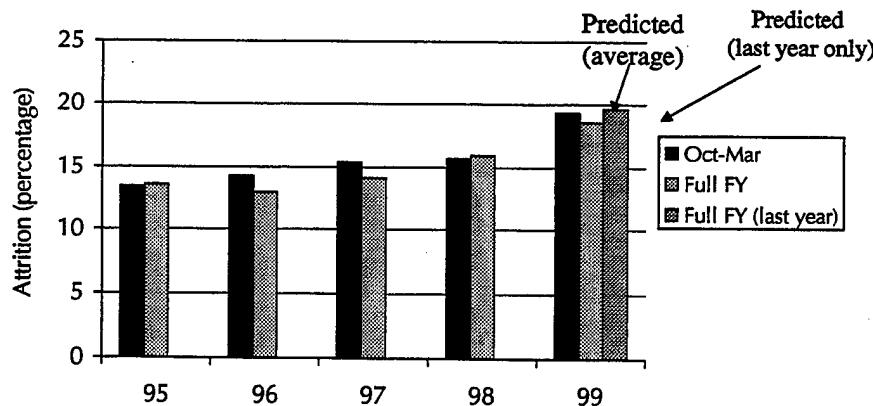


All data are from CNET reports. The year-to-date attrition rate is calculated as attrites in the period divided by either the student flow or accessions in the period.

Over any 12-month period, the two measures of attrition (attrites/student flow or attrites/accession) are virtually the same. Because of seasonality in the timing of accessions, however, the two measures are not the same over a shorter period of time. Year-to-date attrition rates in March show attrites/accessions generally calculating a higher attrition rate than the attrites/student flow attrition rate calculation method. The differences are largest in 1998 and 1999.

It is frustrating that we cannot have real-time unambiguous attrition rate calculations and that we cannot predict with certainty what the full-year attrition rate will be at bootcamp. At various points in this briefing and in the backup slides, however, we use the different methods for measuring real-time bootcamp attrition, relate these calculations to historical patterns, and come up with a full-year calculation. All of these full-year calculations suggest a bootcamp attrition rate for FY99 of about 20 percent.

Navy Bootcamp Attrition Rates: Projections from Alt. Method 1



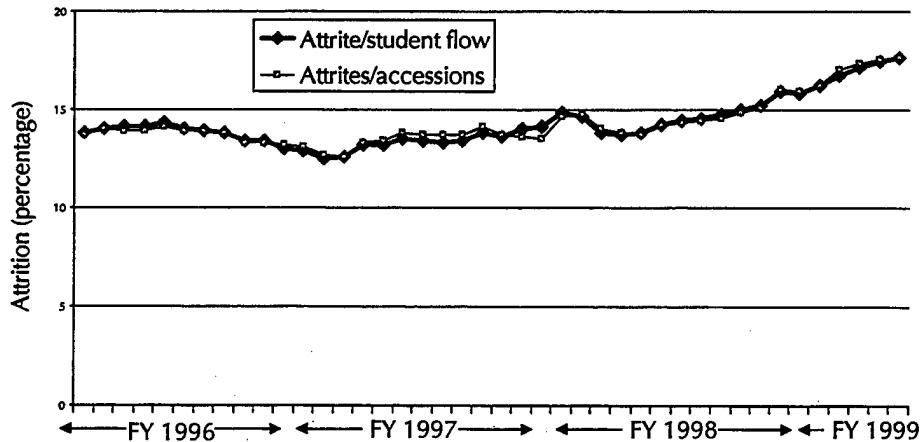
All data are from CNET reports. The attrition rate is calculated as attrites in the period divided by student flow in the period.

In the main text of this briefing, we showed bootcamp attrition rate projections for FY99. For this we used the historical relationship between bootcamp attrition measures as attrites/accressions (year-to-date and full-year rates).* Here we do the calculations by our first alternative method, using attrition as measured by attrites/student flow.

If we take the average relationship between year-to-date and full-year bootcamp attrition, we project a bootcamp attrition rate of 18.6 percent. If we take last year's relationship, we predict a full-year bootcamp attrition rate of 19.6 percent for FY99.

*Full-year bootcamp attrition rates are virtually the same whether they are calculated as attrites/accressions or attrites/student flow. Because of the seasonality, however, year-to-date calculations are different.

Navy Bootcamp Attrition Rates: 12-Month Moving Average, 2 Calculations



All data are from CNET reports. The attrition rate is calculated two ways (attrites divided by student flow or by accessions).

In this briefing, we have alternately calculated bootcamp attrition as

- Attrites/student flow
- Attrites/accessions.

Because of the seasonality in accessions, these two calculations yield different "answers" at different points in the year. For example, for October through March (year-to-date) calculations, the attrites/student flow method results in a lower attrition rate than the attrite/accession method.

We included this slide, however, to show that over any *12-month period* the two methods give virtually the same answer. In fact, the calculated rates are so similar that the two individual lines on the slide are hard to distinguish.

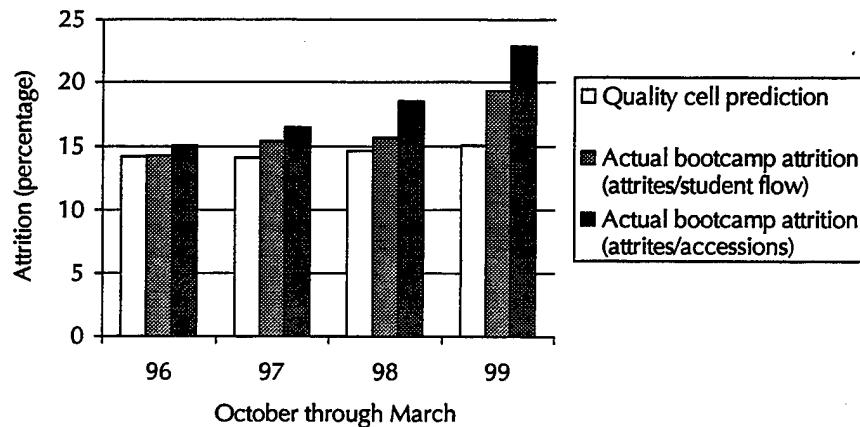
Bootcamp Attrition Rate Projections from Alt. Method 2: 12-Month MA

- 12-month moving average (MA) has increased every month since January 1998
 - No seasonality (always has 12 months in it)
- In FY98 the 12-month moving average was 14.2% in March and 15.9% in Sept (end of year)
- This March the 12-month moving average is 17.6%
 - Will go to 19.7% for full year if historical pattern continues

As the slide states, if the patterns of last year continue, the full-year FY99 bootcamp attrition rate that we project from the 12-month moving average is 19.7 percent. This means that we are assuming that the patterns of last year, when the moving average increased each month over the summer months, will continue. We believe that this is a realistic projection. Although the individual month attrition rates last summer were lower than they were in the early months of FY98, the FY98 summer bootcamp attrition rates were a lot higher than they had been in the summer of FY97.

For the 12-month moving average to fall in the remaining months of this year, bootcamp attrition needs to be lower than it was in the same period in FY98. We know of nothing that would lead us to believe that will be the case.

Actual Bootcamp Attrition Vice Attrition Predicted From Quality Cell Distribution



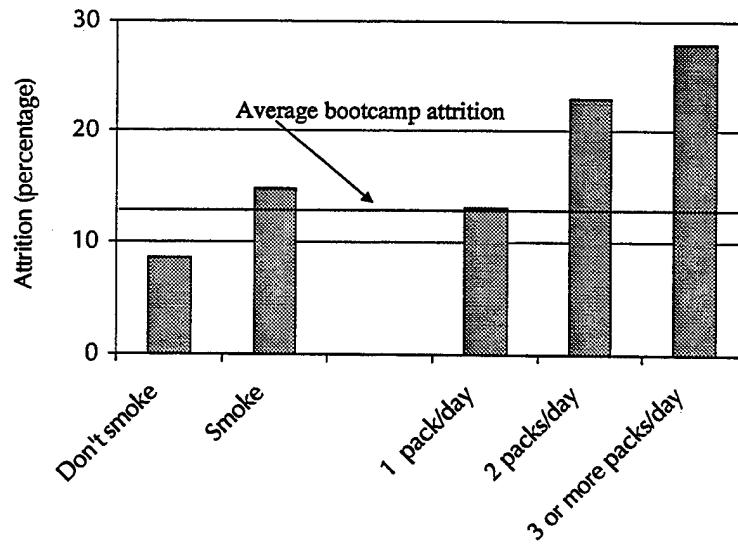
Note: Quality cell predicted attrition is from baseline FY94-96 quality cell attrition behavior.

This slide is identical to one earlier in the briefing except that it has the two calculations for actual attrition (attrites divided by accession and attrites divided by student flow).

Here we used the baseline attrition rates for each quality cell and the actual quality cell distributions to calculate the "quality cell predicted attrition" for the first 6 months of each fiscal year. This prediction, shown as white bars on the slide, reflects the attrition one would have had *if the accessions had attrited at the baseline quality cell rate (FY94-96)*. As one can see from the slide, reductions in quality over the period would have caused the attrition rate to increase by about 1 percentage point (from 14.2 percent in FY96 to 15.1 percent in FY99). The attrition rate, however, increased considerably more than that accounted for by the observed changes in accession quality. When we measure the actual attrition rate as attrites divided by student flow (as in the slide in the main part of the briefing), the increase is 5 percentage points (from 14.3 percent in 1996 to 19.3 percent in 1999). When we measure it by attrites divided by accessions, the increase is even larger (from 14.3 to 22.9 percent).

In brief, the attrition rates that we would have predicted from the accession quality are far below the attrition rates reported by the bootcamps in the CNET reports.

Navy Bootcamp Attrition and Smoking



The bootcamp attrition results, by prebootcamp smoking and nonsmoking behavior, are very sharply delimited.* While we have many other indicators that sharply delineate attrition behavior, most of the high-attrition results are for relatively small categories of recruits (high school nongraduates, very low scores on intelligence tests). We are not aware of any results that create such a sharp difference between large categories of recruits: the 37 percent who were preservice smokers and the 63 percent who were not. These attrition findings are also supported by multivariate analyses that control for other characteristics and estimate the independent effect of smoking behavior on attrition. They are very powerful findings.

Bootcamp attrition rates are also sharply delimited by the number of packs of cigarettes per day that the recruit reported smoking before bootcamp. For recruits who reported smoking two packs a day (12 percent of recruits), the bootcamp attrition rate was 23 percent; for those who reported smoking three or more packs per day (1 percent of recruits), the bootcamp attrition rate was 28 percent. *If* the Navy could recruit its accessions entirely from the non-smoking population and *if* the current attrition behavior continued, about 1,500 more recruits would have graduated from bootcamp from October 1996 through December 1997.

*In making the smoking/nonsmoking comparisons, we use bootcamp attrition data from October 1996 through December 1997, a period for which we have good data on preservice smoking behavior.

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